PRACTICE EXAM 19: ASE A7 SIMULATION (50 QUESTIONS)

1. A vehicle's A/C system was recently serviced at another shop. The customer reports that the system produces very cold air from the vents, but the compressor makes a loud knocking noise at idle that was not present before the service. Gauge pressures show low side 26 psi and high side 195 psi at 82°F ambient — both within normal range. What should the technician investigate regarding the previous service?

A. Whether the wrong refrigerant type was installed, since cross-contamination produces noise from chemical reaction

B. Whether the compressor mounting bolts were loosened during the service and not properly retorqued afterward

C. Whether excess oil was added during the service, since too much oil reduces compressor internal clearances and produces hydraulic noise

D. Whether the drive belt was contaminated with refrigerant oil during the service, causing belt-induced vibration noise

2. A technician is replacing an evaporator on a vehicle with a TXV system. The evaporator failed due to a pinhole external corrosion leak — no internal debris was released. Which of the following components does NOT need to be replaced during this repair?

A. The compressor, since no debris was released and the compressor was operating normally before the evaporator developed its leak

B. The receiver-drier, since the system will be opened to atmosphere and the desiccant must be fresh for the rebuilt system

C. The O-rings at all disturbed connections, since reusing old O-rings risks leaks at the reassembled fittings

D. The TXV, since the old valve's sensing bulb and capillary tube were exposed to the elements during disassembly

3. A vehicle's engine temperature gauge fluctuates between 185°F and 210°F in a repeating cycle approximately every 3 minutes during normal driving. The heater output fluctuates between hot and warm in sync with the gauge. The coolant level is correct. What is the MOST likely cause of this cyclical behavior?

A. A partially restricted radiator that alternately blocks and passes coolant as thermal expansion changes the gap size

B. A faulty engine coolant temperature sensor that sends erratic voltage spikes to the gauge and HVAC module

C. A water pump with a cracked impeller blade that creates flow pulsations at specific RPM ranges during driving

D. A thermostat that is sticking intermittently — opening and closing erratically rather than maintaining a steady position

4. On a vehicle with electronic HVAC controls, the technician retrieves DTC B0244 — Mode Door Actuator Overcurrent. The technician disconnects the mode door actuator and clears the code. With the actuator disconnected, the technician applies 12V directly to the actuator motor terminals. The motor runs smoothly in both directions with no unusual noise or resistance. What does this test eliminate?

A. A seized mode door inside the HVAC housing, since the motor test only confirms the motor runs without load

B. An internal motor or gear failure in the actuator, since the motor operates normally when powered directly

C. A wiring fault between the HVAC module and the actuator connector that could cause overcurrent conditions

D. A failed HVAC module output driver that is sending excessive voltage and triggering the overcurrent protection

5. A vehicle's A/C compressor clutch does not engage. The technician jumps the clutch relay socket terminals 30 and 87 and the clutch engages normally. The compressor runs and cools well. What does this relay bypass test specifically prove?

A. Everything downstream of the relay — wiring, pressure switches, clutch coil, and ground — is functional

B. The compressor is functioning correctly but the HVAC module has a failed relay driver output circuit

C. The relay itself has failed and must be replaced since bypassing it proves it was the sole fault in the circuit

D. The A/C pressure switch is preventing engagement and bypassing the relay also bypasses the switch

6. A vehicle's cooling system was flushed and refilled with new coolant two weeks ago. The customer reports that the heater works well but an intermittent gurgling noise comes from behind the dashboard during acceleration. The engine temperature is stable at 200°F. Both heater hoses are hot. What is the MOST likely cause?

A. The new coolant type has a different boiling point that produces micro-boiling at the heater core during acceleration

B. A heater core that developed a micro-crack during the flush procedure and is allowing air into the coolant stream

C. A residual air pocket trapped in the heater core from the refill procedure that shifts audibly during acceleration changes

D. The water pump is cavitating during acceleration because the new coolant has a lower viscosity than the original

7. A vehicle has an A/C system that was properly charged to specification. The technician measures the condenser inlet temperature at 180°F and the condenser outlet temperature at 108°F. The ambient temperature is 86°F. The high-side pressure is 210 psi. Using the P-T chart, 210 psi corresponds to approximately 120°F saturation temperature. What are the subcooling and the condenser temperature drop values?

A. Subcooling is 60°F (180 minus 120) and condenser drop is 72°F (180 minus 108) — both are excessively high

B. Subcooling is 22°F (108 minus 86) and condenser drop is 72°F (180 minus 108) — both represent ambient rejection

C. Subcooling is 72°F (180 minus 108) and condenser drop is 12°F (120 minus 108) — the large drop confirms overcharge

D. Subcooling is 12°F (120 minus 108) and condenser drop is 72°F (180 minus 108) — both values are within normal range

8. A vehicle's A/C system produces adequate cooling at 44°F vent temperature. However, the customer reports a strong mildew odor during the first minute of operation that disappears after the system runs for 60 seconds. The vehicle is 5 years old and has never had the evaporator treated. The cabin air filter was replaced one month ago. What should the technician do to address the odor?

A. Replace the evaporator since the 5-year-old microbial growth has penetrated the aluminum surface permanently

B. Install a new cabin air filter with activated charcoal since the standard filter cannot trap microbial volatile compounds

C. Flush the refrigerant system with approved solvent to remove internal contamination causing the odor at the evaporator

D. Apply an antimicrobial evaporator cleaner through the HVAC housing and verify the condensation drain is clear

9. On a vehicle with automatic temperature control, the customer reports that the system blows cold air from the panel vents and hot air from the floor vents simultaneously during normal BI-LEVEL operation. The set temperature is 72°F and the cabin is at 72°F. The scan tool shows the system in BI-LEVEL mode. Is this a malfunction?

A. Yes — bi-level should deliver the same temperature from both outlet levels and different temperatures indicate a blend fault

B. No — bi-level mode is specifically designed to deliver cooler air to the upper body and warmer air to the lower body for comfort

C. Yes — the temperature difference indicates the blend door has a crack that splits heated and cooled air unevenly

D. No — but only if the temperature difference is less than 15°F; a larger difference indicates a mode door problem

10. A technician is testing the A/C compressor clutch electrical circuit. With the clutch engaged and operating, the technician performs a voltage drop test on the clutch coil ground wire — red lead on the motor ground terminal, black lead on the battery negative post. The reading is 0.15V. What does this confirm?

A. The ground circuit has low resistance with acceptable voltage drop, confirming the ground path is in good condition

B. The reading is too low and indicates the coil has an internal short that is pulling the ground voltage below normal

C. The test should show exactly 0.0V for a good ground and 0.15V indicates borderline resistance needing cleaning

D. The voltage drop test was performed incorrectly because the leads should be reversed for ground circuit testing

11. A vehicle's engine runs at a steady 200°F. The customer has the heater set to full hot with the blower on HIGH. The floor vent temperature is 128°F. The supply hose at the firewall is 198°F and the return hose is 178°F. The customer's previous vehicle produced 140°F floor vent air. Is this vehicle's heater system performing within normal expectations?

A. No — the 128°F vent temperature is below the minimum 135°F standard that all automotive heaters must achieve

B. No — the 20°F differential between the hoses indicates a restriction that is limiting heat transfer to the air

C. Yes — heater output varies between vehicle designs, and 128°F with a 20°F hose differential is within normal range

D. Yes — but only temporarily, because the 20°F differential will widen as the heater core degrades further

12. Technician A says that a parallel flow condenser with micro-channel tubes cannot be effectively flushed after a catastrophic compressor failure and must be replaced. Technician B says that a serpentine tube condenser with open internal passages can be flushed with approved solvent in the reverse flow direction after a compressor failure. Who is correct?

A. Technician A only, because serpentine condensers also cannot be flushed due to their internal baffle plates

B. Both Technician A and Technician B are correct about the flushability limitations of each condenser type

C. Technician B only, because all condenser designs can be effectively flushed regardless of internal tube geometry

D. Neither Technician A nor Technician B, because all condensers must be replaced after any compressor failure

13. A vehicle's A/C system has been charged to the manufacturer's 24-ounce specification. The vent temperature is 42°F at 84°F ambient. The compressor runs continuously without cycling. This vehicle uses a TXV system. Is the continuous compressor operation a concern?

A. Yes — continuous operation without cycling indicates a stuck cycling switch that should disengage the compressor periodically

B. Yes — the compressor should cycle every 30–45 seconds in any A/C system regardless of the metering device type

C. No — but only if the system also has a variable displacement compressor that reduces output at the set temperature

D. No — TXV systems commonly run the compressor continuously and regulate evaporator temperature through refrigerant flow control

14. A vehicle's cooling system has a slow external coolant leak. The technician performs a pressure test and the system holds 16 psi for 20 minutes with no visible external drips. The technician then drives the vehicle for 30 minutes and re-inspects. Small drips are now visible at the water pump weep hole. Why did the static pressure test fail to reveal this leak?

A. The water pump shaft seal only leaks under dynamic conditions when the shaft rotates and generates internal pressure pulses

B. The static pressure of 16 psi is below the threshold needed to push coolant past the water pump's shaft seal

C. The pressure tester's hose has a slow leak that masked the system's leak by maintaining artificial pressure balance

D. The weep hole only connects to the pump housing cavity when the impeller is spinning and creating flow pressure

15. On a vehicle with electronic HVAC controls, the technician scans the HVAC module and retrieves two DTCs: B0112 (Ambient Temperature Sensor Circuit High Voltage) and B0117 (In-Car Temperature Sensor Performance). The A/C compressor does not engage. The blower runs at maximum speed continuously. What is the connection between the sensor faults and the symptoms?

A. The two sensor faults are coincidental and unrelated — a separate wiring fault is preventing compressor engagement

B. The ambient sensor fault triggers a module failsafe that disables all outputs until the sensor circuit is repaired

C. Both sensors share a common 5V reference supply or ground wire, and a single wiring fault could affect both simultaneously

D. The in-car sensor fault prevents the module from calculating temperature error, which disables compressor engagement

16. A vehicle's A/C system has the following readings at 88°F ambient: low side 45 psi, high side 280 psi, vent temperature 56°F. The condenser face is clean and the fan operates at high speed. The system was recently serviced. Subcooling measures 21°F. What is the MOST likely cause of the elevated pressures?

A. A restricted condenser that is not rejecting adequate heat despite the clean external face and functioning fan

B. A condenser that is working correctly but is undersized for this vehicle's refrigerant capacity and heat load

C. An overcharge of refrigerant or non-condensable gases introduced during the recent service procedure

D. A failing compressor that is generating excessive discharge pressure from internal valve plate warping

17. A vehicle has a TXV-equipped A/C system. The technician replaces the TXV and carefully installs the sensing bulb on the suction line at the evaporator outlet with proper insulation. After charging, the system produces 40°F vent temperatures. However, the technician notices the superheat is only 3°F — below the 8–12°F specification. What does this indicate?

A. The replacement TXV has been factory calibrated to a lower superheat setting that will damage the compressor

B. The new TXV is slightly overfeeding the evaporator — liquid refrigerant may reach the compressor under some conditions

C. The 3°F superheat is acceptable for a new TXV during its initial break-in period and will increase over time

D. The sensing bulb is making excellent thermal contact and the lower superheat indicates superior valve responsiveness

18. A vehicle's engine reaches 205°F operating temperature. The heater works well. However, the customer reports hearing a faint, high-pitched whistle from under the dashboard that begins approximately 30 seconds after the engine starts and continues until the engine is shut off. The whistle does not change with blower speed, A/C on/off, or temperature setting. What is the MOST likely source?

A. A heater core hose connection or restriction inside the heater core that creates turbulence noise as coolant flows through

B. The evaporator making refrigerant flow noise that is amplified by the HVAC housing and transmitted into the cabin

C. A cabin air filter that is slightly misaligned in its housing and vibrates at a specific frequency from engine vibration

D. Coolant flowing through a partially restricted heater control valve that creates a venturi whistle effect

19. On a vehicle with ATC, the scan tool shows the blend door commanded at 40% and actual at 40%. The evaporator temperature reads 37°F. The engine coolant is at 205°F. The set temperature is 72°F and the in-car sensor reads 76°F. The vent temperature is 65°F. Is the system responding correctly to the 4°F temperature error?

A. Yes — with the cabin 4°F above the set point, the module commands a moderate blend position to gradually reduce the temperature without overshooting

B. No — with the cabin 4°F above set point, the blend door should be at 0% full cold to bring the temperature down

C. Yes — but the 65°F vent temperature is too warm for a 37°F evaporator and indicates a blend door calibration error

D. No — the 40% blend position would produce approximately 85°F vent air and the 65°F reading indicates a sensor fault

20. A technician is diagnosing a vehicle where the A/C compressor engages when the engine is first started each morning but disengages after exactly 60 seconds and will not re-engage for the rest of the

day. Cycling the ignition does not reset the problem — only an overnight cool-down restores the 60-second operation the next morning. No DTCs are stored. What should the technician suspect?

A. A failing HVAC control module that enters a thermal protection mode after 60 seconds of compressor load

B. A compressor clutch coil with a developing thermal open — the coil works when cold but the winding opens as it heats

C. An intermittent cycling pressure switch that trips after 60 seconds as the system pressures change from startup

D. A displacement control valve that reduces output to zero after 60 seconds and the module interprets this as a fault

21. A vehicle's cooling system uses a pressurized degas bottle with an integrated pressure cap. The technician notices the degas bottle has a small crack at its seam. The customer asks if the crack can be repaired with epoxy rather than replacing the bottle. What should the technician advise?

A. Epoxy repair is acceptable for small cracks as long as the epoxy is rated for 250°F continuous temperature exposure

B. The crack can be repaired with a specialized plastic welding technique that permanently bonds the seam material

C. A temporary repair with epoxy is acceptable for 30 days to allow the customer to budget for replacement parts

D. The degas bottle must be replaced because it operates under 16 psi system pressure and any repair risks sudden failure under pressure

22. A vehicle has an A/C compressor that was replaced one month ago. The system cools well but the customer reports a brief metallic rattle for 2 seconds each time the compressor clutch engages. The rattle stops once the compressor reaches steady operation. Gauge pressures are normal. What is the MOST likely cause?

A. Liquid refrigerant slugging the compressor at each startup — the accumulator or TXV is allowing liquid to pool near the compressor inlet

B. A loose compressor mounting bolt that allows the compressor body to shift momentarily under the engagement torque

C. Normal clutch engagement noise from the new compressor that is louder than the original due to different friction material

D. A worn serpentine belt tensioner that cannot maintain grip during the momentary torque spike of clutch engagement

23. A vehicle's A/C system has been evacuated to 475 microns. The technician closes the manifold valves and turns off the vacuum pump. The micron gauge reading rises to 550 microns within 1 minute and then stabilizes at 550 microns for the next 15 minutes with no further rise. What should the technician conclude?

A. A small system leak exists because any rise above 500 microns after closing the valves indicates atmospheric intrusion

B. A small amount of residual moisture evaporated and stabilized — the system has passed the vacuum decay test

C. The reading is inconclusive and the technician should re-evacuate for an additional 30 minutes before retesting

D. The vacuum pump check valve is leaking back and the system should be retested with a different pump

24. On a vehicle with electronic HVAC controls, the technician finds that the A/C compressor engages in the DEFROST position but does not engage when the A/C button is pressed in PANEL mode. No DTCs are stored. The compressor cools normally in defrost. What is the MOST likely cause?

A. A low refrigerant charge that prevents engagement except in the defrost override mode which bypasses the switch

B. A faulty compressor clutch relay that only passes adequate current when triggered by the defrost circuit path

C. A failed A/C request button or its signal circuit — the module never receives the A/C request in normal modes

D. A failing evaporator temperature sensor that prevents engagement except when defrost overrides the sensor logic

25. A vehicle's A/C system uses an electronic pressure transducer. The scan tool shows the pressure reading at 4.7V. The sensor's valid operating range is 0.5V–4.5V. The compressor does not engage. What can the technician determine?

A. The system is dangerously overcharged and the pressure has exceeded the transducer's maximum reading capability

B. The sensor connector has been contaminated with water creating a voltage-elevating bridge between signal pins

C. The HVAC module is providing excessive reference voltage to the sensor due to a faulty internal voltage regulator

D. The signal exceeds the valid range — the module reads a circuit fault and disables the compressor for protection

26. A vehicle's engine has been running for 20 minutes at operating temperature. The technician touches the upper radiator hose and it is hot. The lower radiator hose is significantly cooler — approximately 40°F less than the upper hose. Is this normal?

A. Yes — the upper hose carries hot coolant from the engine to the radiator, and the lower hose carries cooled coolant back after heat rejection

B. No — both hoses should be approximately the same temperature because the radiator does not cool the coolant significantly

C. No — a 40°F difference indicates a severe radiator restriction that is preventing adequate coolant flow through the core

D. Yes — but only if the thermostat is fully open, because a partially open thermostat would produce a smaller differential

27. Technician A says that when measuring subcooling, the technician measures the actual condenser outlet temperature and subtracts it from the P-T chart saturation temperature at the measured high-side pressure. Technician B says that when measuring superheat, the technician measures the actual suction line temperature and subtracts the P-T chart saturation temperature at the measured low-side pressure. Who is correct?

A. Technician A only, because superheat is measured at the compressor discharge port not the evaporator outlet

B. Both Technician A and Technician B correctly describe the measurement and calculation method for their respective values

C. Technician B only, because subcooling uses the ambient temperature as the reference point not the saturation temperature

D. Neither Technician A nor Technician B, because both subcooling and superheat are measured with dedicated gauges only

28. A vehicle has a confirmed A/C refrigerant leak at the compressor shaft seal. The compressor is 7 years old and makes no abnormal noises. The technician determines the shaft seal is not independently replaceable on this compressor model. What is the correct repair approach?

A. Add refrigerant and a sealant additive to the system, which will chemically bond to the shaft seal and stop the leak

B. Replace only the clutch assembly since the shaft seal is integrated into the clutch hub bearing on this model

C. Replace the entire compressor since the shaft seal cannot be independently serviced on this design

D. Install an external seal adapter that clamps around the compressor shaft housing and provides a secondary seal

29. On a vehicle with vacuum-operated HVAC controls, the floor mode works correctly. The panel mode works correctly. However, selecting DEFROST produces air from both the defrost and panel vents simultaneously instead of defrost only. All other modes work correctly when selected. What is the MOST likely cause?

A. A misrouted vacuum hose that sends vacuum to both the defrost and panel actuators simultaneously in defrost

B. The vacuum check valve has a slow leak that cannot maintain enough vacuum for the defrost actuator's larger diaphragm

C. A cracked HVAC housing that allows air to bypass the mode door and exit through the panel vents in defrost mode

D. A leaking diaphragm in the specific vacuum actuator that controls the defrost-to-panel air split function

30. A vehicle's A/C system has the following condition: the system was working normally until a serpentine belt replacement was performed. After the belt replacement, the A/C compressor does not engage. The scan tool shows the HVAC module commanding the relay ON. The relay clicks. The technician measures 12.2V at the compressor clutch coil positive terminal. The clutch does not engage. What is the MOST likely cause?

A. The clutch coil ground wire was accidentally disconnected or left unattached during the belt replacement procedure

B. The new belt is thicker than the original and is preventing the clutch hub from fully contacting the pulley face

C. The belt replacement procedure damaged the compressor clutch coil internally from excessive side-loading

D. The HVAC module needs to be reset after any serpentine belt replacement to re-enable compressor authorization

31. A vehicle has dual-zone climate control. The driver side produces 68°F as set. The passenger side produces 78°F despite being set to 68°F. The scan tool shows the passenger blend door commanded to 8% and actual at 8%. Both readings match. What is the MOST likely cause?

A. The passenger-side blend door actuator has drifted in calibration and 8% no longer corresponds to the near-cold position

B. The passenger-side blend door shaft is disconnected from the door — the actuator reports 8% but the door is at a warmer position

C. A refrigerant distribution imbalance in the evaporator that delivers less cooling to the passenger-side air passages

D. The passenger-side in-car temperature sensor is reading colder than actual, causing the module to undercommand cooling

32. On a vehicle with electronic HVAC controls, the technician finds that the scan tool bidirectional test for the blend door actuator works correctly — the actuator moves to every commanded position and the feedback matches. However, when the technician exits the bidirectional test and returns to normal system operation, the blend door does not respond to temperature setting changes from the control panel. What should the technician check?

A. The HVAC control panel temperature buttons and their signal path to the HVAC module for an input fault

B. The HVAC module's transition logic between scan tool diagnostic mode and normal operational control mode

C. The CAN bus for intermittent faults that only manifest under normal operating conditions, not during scan testing

D. The blend door actuator for a thermal-sensitive motor that only functions when directly commanded at full voltage

33. A vehicle's engine temperature gauge has been reading slightly lower than normal for the past few months. The technician installs a new thermostat rated at 195°F. After the installation, the engine reaches 200°F and the heater produces excellent heat. Three months later, the customer returns — the gauge has dropped back to 180°F and the heater output has decreased again. What has MOST likely occurred?

A. The new thermostat is the wrong temperature rating and was mislabeled by the manufacturer during packaging

B. The engine's cooling system has a chronic contamination issue that is degrading thermostat wax elements prematurely

C. The radiator has developed a progressive restriction that is changing the flow pattern and affecting thermostat behavior

D. The replacement thermostat has failed in the same manner as the original — prematurely opening below its rated temperature

34. Technician A says that the evaporator absorbs heat from the cabin air through the process of latent heat absorption as liquid refrigerant changes state to vapor inside the evaporator tubes. Technician B says that the evaporator fin surfaces use forced convection from the blower motor airflow to transfer heat from the cabin air to the cold refrigerant-filled tubes. Who is correct?

A. Technician A only, because forced convection plays no role in the evaporator's heat absorption mechanism

B. Technician B only, because the refrigerant's change of state is a secondary effect rather than the primary cooling method

C. Both Technician A and Technician B correctly describe different aspects of the evaporator's heat absorption process

D. Neither Technician A nor Technician B, because the evaporator works primarily through radiation heat transfer

35. On a vehicle with electronic HVAC controls, the A/C compressor engages and disengages every 2 seconds. The system does not cool. The scan tool shows the HVAC module commanding the compressor ON continuously. Gauge pressures fluctuate wildly with each cycle. What is the MOST likely cause?

A. A failed HVAC control module pulsing its relay driver output at a rapid rate due to an internal circuit malfunction

B. A critically low refrigerant charge causing the low-pressure cutout switch to trip almost immediately after each engagement

C. A worn compressor clutch with an excessively wide air gap that causes the hub to engage and immediately slip off

D. An intermittent relay coil connection that energizes briefly then breaks contact as engine vibration affects the terminal

36. A vehicle's cooling system has been drained and refilled with the correct HOAT coolant after a water pump replacement. One week later, the customer returns reporting that the coolant level has dropped approximately one inch in the reservoir. No external leaks are visible. The pressure test holds at 16 psi for 20 minutes. The combustion gas test is negative. What is the MOST likely explanation?

A. Residual air pockets trapped during the coolant refill are gradually purging from the system through the reservoir

B. The new water pump has a slightly different impeller design that operates at lower pressure and allows seepage

C. The HOAT coolant has a different thermal expansion rate than the original coolant and contracts more when cold

D. A micro-crack in the cylinder head liner only opens under the thermal stress of sustained driving not static testing

37. A vehicle's A/C system has a confirmed leak at the high-side service port Schrader valve. The technician replaces the valve core using a specialized tool that does not require full refrigerant recovery. After the replacement, the technician verifies no leak at the port. What is the MOST critical follow-up step?

A. Add 2 ounces of refrigerant to compensate for the small amount lost during the Schrader valve replacement

B. Replace the accumulator or receiver-drier since the system was briefly exposed to atmosphere during the core swap

C. Perform a complete system evacuation since any opening introduces moisture that cannot be tolerated in the system

D. Verify the system charge is still adequate by checking subcooling and superheat to confirm no significant loss occurred

38. A vehicle's heater core has been bypassed by a previous owner by connecting the two heater hoses together with a bypass tube at the firewall. The customer now wants the heater restored. The technician removes the bypass and reconnects the heater hoses to the heater core. After refilling and bleeding the cooling system, the heater produces lukewarm air despite the engine reaching 205°F. Both heater hoses are warm. What is the MOST likely cause?

A. The bypass tube was a smaller diameter than the heater hoses and the reduced flow it allowed has damaged the pump

B. The engine thermostat needs to be replaced because the bypass changed the cooling system's flow dynamics

C. The heater core is clogged from sitting stagnant with old coolant while bypassed — it needs flushing or replacement

D. Air is trapped in the long-unused heater core passages and needs additional bleeding cycles to fully purge

39. A vehicle has an A/C compressor with a clutchless variable displacement design. The scan tool shows displacement commanded at 100% but the low-side pressure is 44 psi and the high-side is only 150 psi at 90°F ambient. The vent temperature is 55°F. What is the MOST likely cause?

A. The electronic displacement control valve is stuck at reduced displacement and not responding to the module's maximum command

B. The compressor has lost internal compression from worn scrolls or pistons and cannot generate adequate pressure differential

C. The condenser fan is operating at reduced speed, limiting heat rejection and artificially lowering the high-side pressure

D. The system is severely undercharged and the reduced refrigerant mass cannot support full-displacement pressures

40. On a vehicle with ATC, the scan tool shows the in-car temperature sensor reading 65°F while the technician's thermometer at the sensor location reads 72°F. The set temperature is 72°F. The blend door is at 45% (warming the air). What effect is this 7°F-too-cold sensor reading having on system operation?

A. No effect — the module compensates for sensor offsets using the ambient and evaporator temperature data as corrections

B. The module is commanding full cold because it believes the cabin is already well below the set temperature

C. The module is commanding the compressor to disengage because it believes the cabin has reached the set point

D. The module believes the cabin is 7°F colder than the set point and is commanding the blend door toward warm to heat the cabin

41. A vehicle's A/C system was recently recharged at a quick-service shop. The customer reports adequate cooling but notices the compressor never cycles off — it runs continuously. The system uses an orifice tube with a cycling clutch switch. Low-side pressure is steady at 42 psi. The vent temperature is 42°F. What is the MOST likely cause of the continuous operation?

A. The cycling clutch switch has failed with welded contacts that keep the circuit complete regardless of pressure

B. The system was overcharged at the quick-service shop, keeping the low-side pressure perpetually above the switch cutout point

C. The compressor has a seized electromagnetic clutch that cannot disengage even when the module commands it off

D. Normal system operation because the ambient temperature is high enough to prevent the low side from reaching cutout

42. On a vehicle with electronic HVAC controls, the technician attempts to perform a mode door actuator calibration but the scan tool reports "Calibration failed — actuator did not reach hot stop." The cold stop was found successfully. What is the MOST likely cause?

A. The actuator motor has failed in one direction only and cannot drive the door toward the full hot mechanical limit

B. A discharged vehicle battery that provides insufficient voltage for the actuator motor to complete the full travel sweep

C. A physical obstruction inside the HVAC housing that prevents the blend door from reaching its full hot position

D. The HVAC control module's calibration routine has a software error that cannot detect the hot stop on this vehicle

43. A vehicle's engine temperature gauge reads normal at 200°F. However, the infrared thermometer aimed at the thermostat housing reads 225°F. The heater supply hose at the firewall reads 198°F. What is the MOST likely explanation for the temperature discrepancy between the gauge and the infrared reading at the thermostat housing?

A. The engine coolant temperature sensor and the thermostat housing are at different locations in the cooling circuit where temperatures naturally vary

B. The infrared thermometer is reading the external surface of the housing, which absorbs additional radiant heat from the exhaust manifold

C. The engine coolant temperature sensor has failed and is reading lower than actual, masking an overheating condition

D. The thermostat housing gasket has a leak that allows hot combustion gases to heat the housing surface above coolant temperature

44. Technician A says that an R-12 system being retrofitted to R-134a must have all R-12 Schrader fittings replaced with or adapted to R-134a quick-disconnect fittings. Technician B says that the retrofit label must include the refrigerant type, oil type and amount, charge amount, technician name, shop name and address, and the date of retrofit. Who is correct?

A. Technician A only, because the retrofit label requirements include only the refrigerant type and the shop information

B. Technician B only, because the original R-12 fittings can be retained as long as the label clearly identifies R-134a

C. Neither Technician A nor Technician B, because R-12 to R-134a retrofits are no longer permitted under current EPA rules

D. Both Technician A and Technician B are correct about the fitting conversion and the mandatory retrofit label requirements

45. On a vehicle with electronic HVAC controls, the customer reports that the A/C works perfectly in the morning but gradually produces warmer air during the afternoon commute home. The morning commute is 30 minutes and the afternoon commute is 45 minutes on the same route. The morning ambient temperature is 72°F and the afternoon ambient is 94°F. Is this a system fault?

A. Yes — a properly charged system should maintain identical vent temperatures regardless of ambient temperature changes

B. No — higher afternoon ambient temperature naturally reduces cooling capacity, and the longer commute increases heat-soak

C. Yes — the compressor is losing efficiency during the hotter afternoon period, indicating developing internal wear

D. No — but only if the vent temperature difference between morning and afternoon is less than 5°F during driving

46. A vehicle's A/C compressor clutch engages but immediately produces a loud screeching noise. The noise stops when the A/C is turned off. The belt is in good condition and properly tensioned. The technician removes the belt and spins the compressor clutch hub by hand — the shaft turns but with noticeable roughness and grinding resistance. What does this indicate?

A. The compressor has failing internal bearings that produce noise under load — the compressor must be replaced

B. The clutch pulley bearing has failed and is binding when the hub engages and loads the inner bearing race

C. The clutch friction surface has glazed and is not gripping the pulley properly, creating the screeching noise

D. Normal resistance for a compressor that has been sitting idle, which will smooth out after a few minutes of operation

47. A vehicle's cooling system has an electric auxiliary coolant pump that circulates hot coolant through the heater core during engine-off periods on certain hybrid vehicles. The customer reports that the heater stops producing heat immediately when the engine shuts off during a traffic stop. What should the technician check?

A. The hybrid battery charge level, since the auxiliary pump may be disabled when the battery is below a threshold

B. The thermostat for proper operation, since a faulty thermostat would prevent coolant from reaching the heater core

C. The auxiliary coolant pump operation and its control circuit to verify it activates when the engine shuts off

D. The blend door actuator calibration, since hybrid mode transitions may shift the door to the cold position briefly

48. A vehicle's A/C system has both-sides-low gauge readings: low side 15 psi, high side 100 psi at 86°F ambient. The vent temperature is 58°F. The compressor cycles on for 12 seconds and off for 40 seconds. The suction line feels slightly cool but not cold. What is the MOST likely cause?

A. A worn compressor with reduced internal compression that cannot build adequate high-side pressure from the low charge

B. A partially restricted condenser that is limiting heat rejection and artificially suppressing both gauge readings

C. A TXV stuck partially closed that is restricting flow into the evaporator and causing both pressures to be depressed

D. A low refrigerant charge that produces insufficient system mass for normal operating pressures and rapid clutch cycling

49. Technician A says that when a heater core is replaced, the technician should flush the cooling system before installing the new core to remove contaminants that could clog the replacement. Technician B says that when a heater core is replaced, the accumulator or receiver-drier in the A/C system should also be replaced since the HVAC housing was opened. Who is correct?

A. Both Technician A and Technician B, because opening the HVAC housing exposes both the heating and cooling circuits

B. Technician B only, because cooling system flushing has no effect on heater core longevity in the replacement

C. Technician A only, because replacing the heater core does not require opening the sealed A/C refrigerant circuit

D. Neither Technician A nor Technician B, because heater core replacement has no impact on either system's service needs

50. A vehicle's A/C system has been properly serviced — charged to specification, leak tested, and performance verified. The final readings show: low side 30 psi, high side 195 psi, vent temperature 43°F, subcooling 14°F, superheat 10°F at 82°F ambient. What single observation should the technician make before declaring the service complete?

A. Measure the compressor clutch air gap to verify it is within specification and will not require adjustment within the next year

B. Verify the condenser fan activates at the correct temperature threshold and the compressor clutch engages and disengages normally

C. Record the ambient temperature and time of day so future comparisons can account for environmental variables

D. Check the serpentine belt wear gauge to confirm the belt will not fail before the next scheduled A/C service interval

Practice Exam 19: Answer Key and Explanations

1. C — The system cools well with normal pressures, confirming the refrigeration cycle is functioning correctly. The knocking noise at idle that began immediately after service points to something that was changed during that service. Excess oil added to the system reduces the internal clearance volume inside the compressor — at idle RPM, the slower piston speed allows pooled oil to accumulate and produce hydraulic knocking as the pistons or scrolls attempt to compress the incompressible liquid oil with each stroke.

2. A — This is a "does NOT need replacement" question. The compressor was operating normally with no internal damage before the evaporator developed its external corrosion leak — no debris entered the system, no contamination occurred, and the compressor shows no symptoms. Replacing a functional

compressor during a clean evaporator leak repair adds unnecessary cost. The receiver-drier must be replaced (system opened), O-rings must be replaced (standard practice), and the TXV should be evaluated during the service.

3. D — A cyclical temperature fluctuation that repeats on a regular 3-minute interval — with the gauge and heater output moving in sync — is the classic pattern of a sticking thermostat. The thermostat alternately opens (coolant flows to radiator, temperature drops to 185°F, heater cools) and sticks closed (coolant trapped in engine, temperature rises to 210°F, heater heats up). A healthy thermostat modulates smoothly to maintain a steady temperature rather than oscillating between extremes.

4. B — Applying 12V directly to the actuator motor and confirming it runs smoothly in both directions with no unusual noise or resistance eliminates an internal motor or gear failure as the cause of the overcurrent DTC. The motor itself is healthy. However, this bench test does not test the motor under load — a seized mode door would only be detected when the actuator is installed and attempting to move the door. The wiring and module faults also remain possibilities since the motor test does not evaluate them.

5. A — Jumping terminals 30 and 87 at the relay socket sends battery voltage directly from the relay's power input to its output — bypassing the relay entirely but using all the same downstream wiring. Since the clutch engages and cools normally through this bypass, everything downstream of the relay is proven functional: the wiring from the relay socket to the pressure switches, through the switches, through the clutch coil, and back through the ground circuit. The fault is at the relay or its control circuit.

6. C — An intermittent gurgling noise from behind the dashboard during acceleration — with stable engine temperature and hot heater hoses — two weeks after a coolant drain and refill is the classic symptom of a trapped air pocket in the heater core. During acceleration, the water pump's increased flow rate shifts the air bubble inside the heater core passages, producing the audible gurgling. Properly bleeding the cooling system to remove the residual air pocket resolves the noise.

7. D — Subcooling equals the P-T saturation temperature minus the actual condenser outlet temperature: 120°F − 108°F = 12°F subcooling, which is within the normal 10°F–20°F range. The condenser temperature drop is the inlet minus the outlet: 180°F − 108°F = 72°F, which represents the total heat rejected across the condenser — a large drop demonstrating effective condensation and subcooling. Both values confirm normal condenser performance under these operating conditions.

8. D — A strong mildew odor during the first minute of A/C operation that diminishes as the system runs is the classic symptom of microbial growth (mold, mildew, bacteria) on the evaporator surface.

These organisms colonize the constantly moist evaporator fins during off-periods and release volatile organic compounds when the blower first disturbs them. Applying an antimicrobial evaporator cleaner kills the existing growth, and verifying the condensation drain is clear prevents standing water that promotes future colonization.

9. B — Bi-level mode is specifically designed to deliver stratified air temperatures — cooler air from the upper panel vents directed at the occupants' faces and warmer air from the floor vents directed at the feet. This "cool head, warm feet" comfort strategy is a deliberate design feature of bi-level mode in ATC systems. The temperature difference between the upper and lower outlets is normal and intentional, created by routing panel air through the evaporator bypass while floor air passes through more of the heater core.

10. A — A voltage drop of 0.15V across the clutch coil ground wire — from the motor ground terminal to the battery negative post — is well within the maximum acceptable 0.3V for a ground circuit. This low voltage drop confirms the ground wire, its chassis attachment point, and all intermediate connections have minimal unwanted resistance, providing an adequate return path for current through the clutch coil. The ground circuit can be ruled out as a cause of any engagement concerns.

11. C — Heater output varies significantly between vehicle designs based on heater core size, ductwork routing, airflow volume, and engine operating temperature. A floor vent temperature of 128°F with a healthy 20°F hose differential (198°F supply, 178°F return — indicating adequate coolant flow and heat transfer) is within the expected performance range for many vehicles. The customer's previous vehicle may have had a larger heater core or higher engine operating temperature that produced the higher 140°F output.

12. B — Both technicians correctly describe the flushability characteristics of their respective condenser types. Technician A is right that parallel flow condensers with micro-channel tubes have passages too narrow and complex for flushing solvent to reliably remove debris — they must be replaced. Technician B is right that serpentine tube condensers with larger, open internal passages allow solvent to flow freely and carry debris out effectively when flushed in the reverse direction.

13. D — In a TXV system, the expansion valve continuously modulates refrigerant flow based on the sensing bulb feedback to maintain the target superheat — the valve itself prevents evaporator freeze-up by reducing flow when the evaporator gets too cold. The compressor runs continuously because the TXV manages cooling output through flow control rather than compressor cycling. This is normal TXV system operation — unlike orifice tube systems that rely on compressor cycling to prevent freeze-up.

14. A — The static pressure test applies 16 psi uniformly throughout the stationary system, but the water pump shaft seal relies on a different sealing mechanism than the static gaskets and hose connections. The shaft seal operates against the rotating shaft — during operation, dynamic forces (shaft rotation, coolant pressure pulses from the impeller, and thermal expansion of the shaft) create conditions that differ from the static test. The seal leaks under these dynamic conditions but holds under static pressure alone.

15. C — Two sensor DTCs occurring simultaneously — ambient (B0112) and in-car (B0117) — suggest a shared wiring fault rather than two independent sensor failures. Many NTC temperature sensors in automotive HVAC systems share a common 5V reference supply wire or a common ground wire from the HVAC module. A single break, short, or high-resistance connection in the shared wire would affect both sensor circuits simultaneously, triggering both DTCs and disrupting the module's ability to control the system.

16. C — Both-sides-high pressures (45 psi low / 280 psi high) at 88°F ambient with a clean condenser and functioning fan — on a recently serviced system — point to either a refrigerant overcharge or non-condensable gases (air) introduced during the service. Elevated subcooling of 21°F (above the normal 10°F–20°F range) supports the overcharge diagnosis — excess liquid refrigerant backs up in the condenser, subcooling further than normal. The correct remedy is to recover, measure, and recharge to exact specification.

17. B — Superheat of only 3°F is significantly below the 8°F–12°F TXV specification, meaning the refrigerant leaving the evaporator has barely vaporized above its boiling point. The TXV is feeding slightly more liquid into the evaporator than the evaporator can fully evaporate. While the vent temperature of 40°F is excellent, the risk is that under transient conditions — sudden load increase, RPM change — the already-marginal superheat could drop to zero, sending liquid refrigerant into the compressor and causing slugging damage.

18. D — A faint high-pitched whistle that begins 30 seconds after engine start (when coolant begins circulating through the heater core) and does not change with any HVAC control setting points to a coolant-flow-related noise source. A partially restricted heater control valve forces coolant through a narrowed opening, creating a venturi effect that produces a high-pitched whistle. The noise appears when the water pump begins circulating hot coolant and continues as long as flow exists through the restricted valve.

19. A — The cabin is 76°F — only 4°F above the 72°F set point. The ATC module uses proportional control: for a small 4°F error, it commands a moderate blend position (40%) that mixes cold evaporator air with some warm heater air to produce a 65°F outlet temperature. This moderately cool air will

gradually bring the cabin from 76°F down to 72°F without overshooting. Commanding full cold (0%) for a 4°F error would overcool the cabin and create uncomfortable temperature swings.

20. B — A compressor clutch that engages for exactly 60 seconds when cold and then fails for the rest of the day — resetting only after overnight cooling — is the characteristic pattern of a thermal open in the clutch coil winding. When cold, the coil winding makes contact and current flows. As current heats the coil over 60 seconds, a weak or cracked section of wire expands until the circuit opens. The coil cannot re-close until it cools completely overnight, contracting the wire back into contact.

21. D — A pressurized degas bottle operates under 16 psi system pressure during normal engine operation and experiences continuous thermal cycling between cold and hot. Any crack — no matter how small — creates a weak point that will propagate under repeated pressure cycling. Epoxy, plastic welding, or other repairs cannot guarantee long-term integrity under these sustained pressure and temperature demands. A sudden failure could release scalding pressurized coolant, creating a burn hazard and engine overheating.

22. A — A brief metallic rattle for 2 seconds at each compressor clutch engagement that stops once the compressor reaches steady operation suggests liquid refrigerant is present at the compressor inlet at each startup. When the clutch engages, the compressor attempts to compress this incompressible liquid, producing hydraulic hammering sounds. Once the liquid clears and only vapor enters, the noise stops. This typically results from refrigerant migration during off-cycles or a flooded evaporator from a stuck-open TXV or overcharge.

23. B — The micron gauge rose from 475 to 550 microns within 1 minute — a 75-micron rise — and then stabilized at 550 microns for 15 minutes without any further increase. A stabilized reading that does not continue climbing confirms no leak — atmospheric air entering through a leak would produce a continuously rising reading. The small 75-micron rise represents a minor amount of residual moisture that boiled off at the low pressure and then reached vapor pressure equilibrium. The system passes the vacuum decay test.

24. C — The compressor works correctly in defrost mode (through the automatic defrost override that engages the compressor independently of the A/C button), proving the compressor, relay, clutch coil, and all downstream circuits are functional. Only the A/C button in panel mode fails to produce engagement. Since the defrost override bypasses the A/C button's signal path, a failed A/C button or its dedicated circuit that does not send the request signal to the module would produce exactly this pattern.

25. D — The pressure sensor signal of 4.7V exceeds the sensor's valid 0.5V–4.5V operating range. The module recognizes this out-of-range voltage as a circuit fault rather than a valid pressure reading — it could represent an open ground wire, a short to the reference voltage, or a failed sensor element. Because the module cannot determine actual system pressure from an invalid signal, it disables the compressor as a protective measure to prevent operation under unknown conditions.

26. A — The upper radiator hose carries hot coolant directly from the engine (at or near the thermostat outlet temperature) to the radiator inlet. The lower hose carries coolant that has passed through the radiator and released heat to the ambient air. A 40°F temperature difference between the upper and lower hoses demonstrates effective radiator heat rejection — the coolant enters hot and exits significantly cooler. This is normal and desired cooling system behavior.

27. B — Both technicians correctly describe the measurement and calculation methods. Technician A is right that subcooling equals the P-T saturation temperature (at measured high-side pressure) minus the actual condenser outlet temperature. Technician B is right that superheat equals the actual suction line temperature minus the P-T saturation temperature (at measured low-side pressure). Both calculations use the same principle: comparing the actual measured temperature to the theoretical saturation temperature at the corresponding measured pressure.

28. C — The compressor shaft seal leak is confirmed and the technician has determined the seal is not independently serviceable on this compressor model — it cannot be replaced without major compressor disassembly that is impractical in the field. The correct repair is to replace the entire compressor assembly (which includes a new shaft seal), along with the accumulator/receiver-drier (system opened), new O-rings, proper evacuation, and recharging. Sealant additives are not an acceptable permanent repair.

29. D — All other mode positions work correctly, meaning the vacuum supply, reservoir, check valve, and control panel switching are functional. Only the defrost position has a problem — air exits from both defrost and panel vents instead of defrost only. The HVAC system uses a specific vacuum actuator to close the defrost-to-panel air path when defrost is selected. If that actuator's diaphragm leaks, it cannot maintain vacuum to hold the door closed, allowing air to escape through the panel vents in defrost mode.

30. A — The module commands the relay ON, the relay clicks, and 12.2V reaches the clutch coil positive terminal — the entire power supply path from the module through the relay to the coil is functional. Yet the clutch does not engage despite having adequate voltage at the positive terminal. The fault must be in the ground circuit — with no return path for current, the coil cannot energize. During

the belt replacement, the technician likely disconnected or left unattached the clutch coil ground wire that routes near the belt service area.

31. B — The scan tool shows the passenger blend door commanded at 8% and actual at 8% — the feedback matches the command perfectly. Yet the passenger side delivers 78°F instead of the expected cold temperature at an 8% position. If the actuator reports 8% and the module accepts it, but the actual vent temperature contradicts this position, the actuator shaft has disconnected from the blend door. The shaft turns, the feedback gear tracks correctly, but the physical door remains at a warmer position.

32. A — The bidirectional scan tool test proves the HVAC module, the communication pathway to the actuator, and the actuator itself all function correctly — the actuator responds to commands and the feedback is accurate. However, during normal operation (not scan tool test mode), the blend door does not respond to temperature changes from the control panel. Since the module can drive the actuator when commanded by the scan tool, the module's output circuit works. The fault is in the input path — the control panel's temperature buttons or their signal circuit is not communicating setting changes to the module.

33. D — The replacement thermostat worked correctly for three months (engine reached 200°F, heater worked well) before the same symptom returned — gauge dropping to 180°F with reduced heater output. This repeating pattern of thermostat failure suggests the replacement thermostat has developed the same premature-opening fault as the original. If the cooling system has a chronic contamination or scale problem, it may be degrading thermostat wax elements faster than normal, causing repeated premature failures.

34. C — Both technicians describe complementary aspects of the evaporator's heat absorption process. Technician A correctly identifies that the primary cooling mechanism is latent heat absorption — liquid refrigerant absorbs enormous amounts of energy as it changes state to vapor inside the evaporator tubes without changing temperature. Technician B correctly identifies that forced convection from the blower motor's airflow is the mechanism that transfers heat from the warm cabin air across the cold fin surfaces to the refrigerant-filled tubes.

35. B — The module commands the compressor ON continuously (confirmed by scan tool), but the clutch cycles every 2 seconds with wildly fluctuating pressures. This rapid cycling — far too fast for normal cycling switch operation — indicates the low-pressure cutout switch is right at its threshold. The compressor engages, immediately drops the critically low charge's pressure below cutout, disengages, pressure barely recovers, and the cycle repeats within 2 seconds. The system is nearly empty and needs leak detection and repair.

36. A — A coolant level drop of approximately one inch within one week of a drain-and-refill service — with no visible leaks, a holding pressure test, and a negative combustion gas test — is the classic pattern of trapped air pockets gradually purging from the system. During the refill, air is inevitably trapped in high points of the engine block, heater core, and hoses. As the engine heats and cools over several drive cycles, these bubbles work their way to the degas bottle and escape, causing the coolant level to drop until all air is purged.

37. D — A Schrader valve core replacement using a specialized tool involves only momentary, minimal system exposure — not a full system opening. The most critical follow-up is verifying the system charge remains adequate after the procedure. Measuring subcooling and superheat confirms whether the charge is still within specification or whether a small amount was lost during the core swap. If both values are within normal range, no additional service is needed. If either is outside specification, a measured amount should be added.

38. C — The heater core has been sitting stagnant with old coolant inside while the bypass tube carried all coolant flow around it for an extended period. During this time, the stationary coolant inside the core degraded, and corrosion products, scale, and sludge accumulated in the narrow passages without the flushing action of flowing coolant. Upon reconnection, these deposits restrict the flow through the core. The core needs thorough flushing or replacement to restore adequate flow and heat transfer.

39. A — In a clutchless variable displacement compressor, the shaft always turns with the engine. The module commands 100% displacement but the pressures (44 psi low / 150 psi high) show minimal pressure differential — the compressor is spinning but barely pumping. The electronic displacement control valve converts the module's electrical command into mechanical swashplate angle. A valve stuck at reduced displacement ignores the maximum command and keeps the swashplate at a shallow angle, producing minimal pumping despite full shaft rotation.

40. D — The in-car sensor reads 65°F while the actual cabin temperature is 72°F. The module sees a 7°F deficit below the 72°F set point — it believes the cabin is too cold and needs warming. In response, the module commands the blend door to 45% (toward warm) to add heat and raise the perceived 65°F cabin temperature toward the 72°F target. In reality, the cabin is already at 72°F, so the warm blend position makes the cabin uncomfortably warm. The faulty sensor is the root cause.

41. B — The system produces excellent cooling (42°F vent temperature) with the compressor running continuously. In a cycling clutch orifice tube system, the compressor should cycle off when the low-side pressure drops to the cutout point (typically 23–28 psi). The steady 42 psi low-side pressure never reaches this cutout threshold. The quick-service shop likely overcharged the system — the excess refrigerant mass maintains the low-side pressure perpetually above the cycling switch cutout point.

42. C — "Calibration failed — actuator did not reach hot stop" while the cold stop was found successfully means the actuator drove the blend door to full cold without issue but could not drive it to full hot. A physical obstruction inside the HVAC housing — a dislodged piece of foam, shifted component, or foreign object — on the hot-travel side of the door's path prevents it from reaching its full-hot mechanical endpoint. The obstruction must be identified and cleared before recalibrating.

43. A — The engine coolant temperature sensor (which feeds the gauge) and the thermostat housing are at different physical locations in the cooling circuit. The ECT sensor may be located in the cylinder head, engine block, or a coolant passage several inches away from the thermostat housing. Coolant temperatures vary throughout the system — the thermostat housing at the engine outlet may be slightly hotter than the sensor location in a different passage. Both readings can be simultaneously accurate for their respective locations.

44. D — Both technicians correctly describe mandatory EPA retrofit requirements. Technician A is right that all R-12 service fittings must be replaced with or adapted to R-134a quick-disconnect fittings — this prevents future technicians from connecting R-12 equipment to the retrofitted system. Technician B is right that the retrofit label must contain all specified information: refrigerant type, oil type and amount, charge amount, technician name, shop name and address, and the retrofit date. Both the fitting conversion and label are legally required.

45. B — The morning commute at 72°F ambient produces excellent cooling because the lower ambient temperature provides a large temperature differential for condenser heat rejection. The afternoon commute at 94°F ambient — 22°F hotter — reduces the condenser's heat rejection efficiency because the temperature differential between the hot refrigerant and the ambient air is smaller. Additionally, the 45-minute afternoon commute allows more engine bay heat-soak than the 30-minute morning drive. Both factors naturally reduce afternoon cooling performance.

46. A — Removing the belt and spinning the compressor clutch hub by hand reveals noticeable roughness and grinding resistance from the compressor shaft and its internal mechanism. This confirms failing internal bearings — not the external clutch pulley bearing (which would be tested by spinning the pulley without engaging the hub). The internal bearing surfaces have degraded to the point of producing audible screeching under the loaded conditions of A/C operation. The compressor must be replaced along with standard contamination cleanup.

47. C — The auxiliary electric coolant pump's specific function is to circulate hot coolant through the heater core when the engine is off during hybrid auto-stop events. If the pump does not activate, no coolant circulates and the heater core quickly cools, producing the immediate heat loss the customer

describes. Checking the pump's operation — verifying it receives power and ground when the engine shuts off, and confirming the pump motor runs — is the targeted diagnostic step.

48. D — Both-sides-low pressures (15 psi low / 100 psi high) with rapid compressor cycling (12 seconds on, 40 seconds off) and a slightly cool suction line is the classic pattern of a low refrigerant charge. Insufficient refrigerant mass produces below-normal pressures on both sides. The compressor quickly drops the already-low suction pressure to the cycling switch cutout, disengages, and the extended off-time reflects the slow pressure recovery from insufficient charge. The system needs leak detection, repair, evacuation, and proper recharge.

49. C — Technician A is correct that flushing the cooling system before installing a new heater core removes residual contamination that would otherwise migrate to and clog the replacement core — this is an essential step to prevent premature repeat failure. Technician B is incorrect because replacing the heater core does not require opening the sealed A/C refrigerant circuit — the heater core is part of the engine cooling system, and the A/C evaporator is a completely separate sealed refrigerant circuit. The accumulator/receiver-drier replacement is only needed when the A/C system is opened.

50. B — All performance measurements (pressures, vent temperature, subcooling, superheat) confirm the refrigeration system is functioning correctly. Before declaring the service complete, the technician should verify the supporting systems that the static performance test does not evaluate: the condenser fan must activate at the correct temperature threshold (and at both speeds if equipped), and the compressor clutch must engage and disengage normally during cycling. These operational checks confirm the complete integrated system functions under real-world conditions.